

ITS323 – Quiz 4 Answers

Name: _____

ID: _____

Mark: _____ (out of 10)

Question 1 [2 marks]

Assume an analog transmission system is used for transmitting voice calls from SIIT Bangkadi to SIIT Rangsit over a single link. Each voice call from a user is sent with centre frequency of 8/10/8/10kHz and has a bandwidth of 4/5/4/5kHz. What is the minimum bandwidth required for the Bangkadi-Rangsit link to support a maximum of 12/20/20/12 voice calls when using FDM? [2 marks]

Answer

12 voice calls each with bandwidth of 4kHz means 48kHz bandwidth is needed on the link.

Other answers:

5kHz voice call bandwidth, 20 calls: 100kHz

4kHz voice call bandwidth, 20 calls: 80kHz

5kHz voice call bandwidth, 12 calls: 60kHz

Question 2 [2 marks]

Explain an advantage/disadvantage of Synchronous TDM (compared to Statistical TDM). [2 marks]

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Answer

Advantage of Synchronous TDM:

No buffering of data is necessary. No overheads due to headers. Simple process for de-multiplexer

Advantage of Statistical TDM:

Can use a lower data rate for output line because can be more efficient if varying rate of input data.

Question 3 [6 marks]

Consider a link between A and B that has a one-way propagation delay of 10/15/10/20ms. Stop-and-Wait ARQ is used as the error control protocol over the link. Each frame with data has a

transmission time of 5/5/10/10ms. Acknowledgements have a transmission time of 1ms. Assume all processing and queueing delays are 0.

- a) Which of the following values is appropriate for a timeout interval? (circle only one answer) Explain why. (You will only receive marks if the explanation is correct) [2 marks]

10ms 15ms 20ms 30ms 40ms 50ms 120ms

10ms 15ms 20ms 30ms 40ms 50ms 120ms

10ms 15ms 20ms 35ms 50ms 65ms 80ms

15ms 35ms 55ms 75ms 95ms 105ms 115ms

Explanation:

Answer

30ms. The timeout should be greater than expected time to receive an ACK. If the timer is started after sending the data, it should take 21ms to receive the ACK (2 x propagation + ACK). Hence values less than 21ms are inappropriate. However the timeout should not be too long, otherwise the source may spend a large amount of time waiting. Hence 30ms is an appropriate value.

Other answers:

Prop: 15ms, data: 5ms, Ack: 1ms – 40ms

Prop: 10ms, data: 10ms, Ack: 1ms – 35ms

Prop: 20ms, data: 10ms, Ack: 1ms – 55ms

- b) The source A has 2 original data frames to send to destination B. Source starts transmitting the 1st frame at time 0. Unfortunately the 2nd data frame sent is lost before reaching destination B. There are no other errors. Assuming the values above (including your selected timeout interval), calculate the time when the 2nd original data frame has been fully (and successfully) received by the destination B. (You must show calculations) [4 marks]

Answer

The 1st data frame is ACKed by time: 5ms (trans) + 10ms (prop) + 1ms (ACK) + 10ms (prop) = 26ms.

The 2nd data frame is sent, and a timer started at time: 31ms.

With a timeout interval of 30ms, it expires at time 61ms, and the 2nd data frame is retransmitted. It fully arrives at B at time: 61 + 5 (trans) + 10 (prop) = 76ms.

Other answers:

Prop: 15ms, data: 5ms, Ack: 1ms, Timeout: 40ms – 101ms

Prop: 10ms, data: 10ms, Ack: 1ms, Timeout: 35ms – 96ms

Prop: 20ms, data: 10ms, Ack: 1ms, Timeout: 55ms – 146ms